

### **REMARKS**

This Application has been carefully reviewed in light of the Office Action mailed June 4, 2007. Claims 17-24, 26-34 and 36-44 are pending in the application and were rejected in the Office Action. For at least the reasons discussed below, Applicants respectfully request reconsideration and favorable action in this case.

#### **Drawing Objections**

The Examiner objects to the drawings under 37 C.F.R. § 1.83(a) because they do not show every feature of the invention specified in the claims. Specifically, the Examiner states that the figures do not disclose the via extending from the first substrate surface to the second substrate surface, as recited in Claims 20 and 21. Applicants respectfully submit that vias 46 and 50 illustrated in the figures are examples of the type of via recited in Claim 20. Applicants note that they have amended Claims 20 and 21 to address the Examiner's rejection under 35 U.S.C. § 112 and to make it clear that the via recited in Claims 20 and 21 does not have to *only* extend from the first substrate surface to the second substrate surface, but rather that the via extends *at least* from the first substrate surface to the second substrate surface. Thus, Applicants respectfully request reconsideration and favorable action.

#### **Section 112 Rejections**

The Examiner rejects Claims 20, 21, 40 and 44 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As noted above, Applicants have amended Claims 20 and 21 to make it clear that the via recited in Claims 20 and 21 does not have to *only* extend from the first substrate surface to the second substrate surface, but rather that the via extends *at least* from the first substrate surface to the second substrate surface. Furthermore, Applicants have amended Claims 40 and 44 (and Claim 17) to address the antecedent basis and other issues pointed out by the Examiner. Thus, Applicants respectfully request reconsideration and favorable action.

**Section 103 Rejections**

The Examiner rejects Claims 17, 33, 34, 38, and 39 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,154,366 issued to Ma et al. ("*Ma*") in view of U.S. Patent No. 5,866,952 issued to Wojnarowski et al. ("*Wojnarowski*"), and further in view of U.S. Patent No. 6,861,284 issued to Higashi et al. ("*Higashi*").

Independent Claim 17 of the present application, as amended, recites the following limitations:

A multi-layer printed circuit board having at least one prefabricated integrated electronic component embedded therein comprising:

a polymeric circuit board substrate having a first substrate surface, and a second substrate surface, and a cavity formed in said first substrate surface;

a first integrated electronic component, where said first integrated electronic component is prefabricated prior to being securely attached in the cavity;

a first dielectric layer disposed on said first substrate surface and over said first integrated electronic component;

a metallic layer disposed on said first dielectric layer;

an electrically conductive first via passing through said first dielectric layer in contact with said metallic layer;

a second dielectric layer disposed over said first via and over said metallic layer; and

a second electrically conductive via extending at one location through said first and second dielectric layers and electrically coupled to said first integrated electronic component.

To establish a *prima facie* case of obviousness, the references must teach or suggest all elements of the rejected claims and it must have been obvious to one of ordinary skill in the art at the time of invention to combine or modify the references. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 82 U.S.P.Q.2d 1385 (2007); *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Applicants respectfully submit that the cited references do not teach or suggest all elements of the rejected claims and that it would not have been obvious to one of ordinary skill in the art to combine these references in the manner proposed by the Examiner.

As noted above, Claim 1 recites "a polymeric circuit board substrate having a first substrate surface, a second substrate surface, and a cavity formed in said first substrate surface." However, Applicants respectfully submit that the proposed combination of

references does not disclose, teach or suggest a polymeric circuit board substrate having a cavity formed in a first substrate surface. The present Office Action, as with the previous Office Action, does not describe or even mention what feature of *Ma* allegedly teaches this limitation. Applicants believe that it is clear that *Ma* does not disclose a substrate having a cavity formed in the substrate. *Ma* merely shows an IC chip that is mounted on a flexible wiring interconnect, referred to in the patent as a “flex component.” The chip is then encapsulated with an encapsulant, and additional wiring layers may be added onto the flex component. *Ma* is principally directed to the use of moisture barriers surrounding the chip. *Ma* does not show a cavity formed in a substrate in which a prefabricated component is mounted. On the contrary, in *Ma*, a component is surrounded, after having already been connected to a flex component, with an encapsulating material. This technique is much different than securing a prefabricated component in a cavity that has been formed in a substrate. Clearly, the encapsulation material is not a substrate as claimed and does not have a cavity formed therein.

Furthermore, the Office Action contends that, although *Ma* does not disclose a polymeric substrate, it would have been obvious to combine the teachings of *Wojnarowski* with those of *Ma*. In particular, the Office Action asserts that it would have been obvious to use *Wojnarowski's* substrate molding material as the encapsulation material of *Ma* (which the Office Action alleges is the claimed substrate). The Office Action states that this would have been obvious “to have the circuit board substrate being polymeric in order to have a material that adequately supports a die in a substrate form, and any overlaying materials wherein the material is not prone to cracking.” Applicants respectfully disagree with the Examiner. First, *Ma* discloses that the encapsulation material 112 (again, which the Office Action alleges is the claimed substrate) can be a plastic material (a polymer). *See Ma, Column 3, lines 3-5.* Therefore, while Applicants disagree with the Office Action’s assertion that the encapsulation material is the recited substrate, Applicants do not understand why the Office Action uses the teachings of *Wojnarowski* to suggest a supposedly obvious modification to the material of which the encapsulation material is comprised (when it is already disclosed in *Ma* that the encapsulation material may be a polymer). Second, Applicants submit that the Office Action has not provided a sufficient basis for combining the teachings of *Ma* with those of *Wojnarowski*. There is no disclosure or suggestion in *Ma* that the encapsulation material 112

serves to support the die and thus there is no suggestion to modify *Ma* such that the encapsulation material should be modified “in order to have a material that adequately supports a die in substrate form.”

In *KSR Int'l Co. v. Teleflex Inc.*, the Supreme Court clarified the appropriate standard to use when determining obviousness. “The [obviousness] analysis is objective: ‘Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined.’” *Id.* (citing *Graham v. John Deere*, 383 U.S. 1, 17-18, 148 U.S.P.Q. 459 (1966)).

A “principal reason for declining to allow patents for what is obvious” is to prevent individuals from obtaining a patent “for a combination which only unites old elements with no change in their respective functions.” *Id.* However, the Supreme Court clarified that “a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” *Id.* “[A] court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions.” *Id.* While not a rigid test, a showing of a “teaching, suggestion, or motivation” to combine or modify prior art provides helpful insight in determining whether it would have been obvious to combine references. *Id.* “A factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning.” *Id.* (citing *Graham*, 383 U.S. at 36).

In the present case, Applicants respectfully contend that the Examiner provides no indication that the claims “only unite old elements with no change in their respective functions.” Furthermore, the Examiner has not shown a teaching, suggestion, or motivation to combine *Ma* and *Wojnarowski* in the manner suggested. Applicants respectfully submit that the Supreme Court is clear that the type of argument provided in the present Office Action is insufficient to establish obviousness: “Rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *Id.* (citing

*In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). The Office Action has simply not presented any “articulated reasoning with some rational underpinning” that it would have been obvious to make the proposed combination. For at least these reasons, Applicants respectfully submit that the Office Action fails to present a *prima facie* case of obviousness. Therefore, Applicants request that the rejection of Claim 17, as well as the rejections of those claims that depend from Claim 17 (including Claims 33, 34, 38, and 39), be withdrawn.

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Furthermore, the Examiner rejects Claims 18, 20-23, 27, 30, 36, 40, 41, and 43 under 35 U.S.C. § 103(a) as being unpatentable over *Ma* in view of *Wojnarowski* in view of *Higashi*, as applied to Claims 17, 33, 34, 38, and 39, and further in view of U.S. Patent No. 5,565,706 issued to Miura et al. ("*Miura*").

Each of Claims 18, 20-23, 27, 30, 36, 40, 41, and 43 include (either directly or via a base claim) limitations similar to those discussed above with respect to Claim 17. Therefore, these claims are at least allowable for the reasons discussed above. Thus, Applicants respectfully request reconsideration and allowance of these claims.

In addition, Applicants respectfully submit that Claim 18 is also allowable because the Examiner has not shown a teaching, suggestion, or motivation to combine *Miura* with the other cited references in the manner suggested. As the Office Action notes, the combination of *Ma* in view of *Wojnarowski* in view of *Higashi* does not disclose “a first metallic layer disposed on said first substrate surface and a second metallic layer disposed on said second substrate surface,” as recited in Claim 18. However, the Office Action states that such a limitation would be obvious in light of the combination of these references with *Miura*. Specifically, the Office Action states that “it would have been obvious” to have the limitation claimed “in order to include external connections to the substrate.” However, Applicants respectfully submit that there is no suggestion or motivation to provide “external connections” to the die 106 of *Ma* through the disclosed encapsulation material 112. In fact, that would be against the teachings of *Ma* that material 112 *encapsulates* the die (at least on the side on which it is applied). The Office Action has simply not presented any “articulated

reasoning with some rational underpinning” that it would have been obvious to make the proposed combination. For at least this additional reason, Applicants respectfully submit that the Office Action fails to present a *prima facie* case of obviousness with respect to Claim 18.

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The Examiner also rejects Claim 19 under 35 U.S.C. § 103(a) as being unpatentable over *Ma* in view of *Wojnarowski* in view of *Higashi*, as applied to Claims 17, 33, 34, 38, and 39, and further in view of U.S. Patent No. 5,739,188 issued to Desai ("*Desai*").

Claim 19 depends from Claim 17, and thus it is allowable at least for the reasons discussed above in conjunction with Claim 17. Additionally, the Examiner has not shown sufficient motivation to combine *Desai* with *Ma* in view of *Wojnarowski* in view of *Higashi*. First, *Desai* is in a wholly different art than the references with which it has been combined. *Desai* teaches a thermoplastic polymer compound and a method of processing that compound. It does not relate to the formation or processing of polymeric substrates for circuit boards or even to the field of electronic components generally, nor does the reference provide that any of its teachings may be applicable to the formation of a circuit board. *Desai* is primarily concerned with improving the processing stability of thermoplastic polymers and improving their flow characteristics. There is no indication that the problems addressed by *Desai* have any relation to those in *Ma*, *Wojnarowski*, or *Higashi*, or to the present application.

Second, the Examiner has stated as the motivation to combine these references the protection of the substrate. However, the Examiner has provided no support for that line of reasoning. There must be some basis in the references or the art as a whole that provides a teaching, suggestion or motivation to combine. Here, *Desai* teaches a multi-layered polymer product where a core layer is covered by a cap layer not for the protection of the core layer, as suggested by the Examiner, but to hide the imperfections in the core layer. *Desai*, Column 3, lines 26-37. Similarly, there is no teaching in any of the references with which *Desai* was combined that suggests the motivation cited by the Examiner.

For at least this additional reason, Applicants respectfully submit that the Office Action fails to present a *prima facie* case of obviousness with respect to Claim 19. Applicants thus respectfully request reconsideration and allowance.

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In addition, the Examiner also rejects Claim 24, 26, 28, 29, 31, 32, and 44 under 35 U.S.C. § 103(a) as being unpatentable over *Ma* in view of *Wojnarowski* in view of *Higashi*, in view of *Miura* as applied to Claims 18, 20-23, 27, 30, 36, 40, 41, and 43, and further in view of U.S. Patent No. 5,241,456 issued to Marcinkiewicz et al. ("*Marcinkiewicz*").

Each of Claims 24, 26, 28, 29, 31, 32, and 44 include (either directly or via a base claim) limitations similar to those discussed above with respect to Claim 17. Therefore, these claims are at least allowable for the reasons discussed above with respect to Claim 17. Thus, Applicants respectfully request reconsideration and allowance of these claims.

**CONCLUSION**

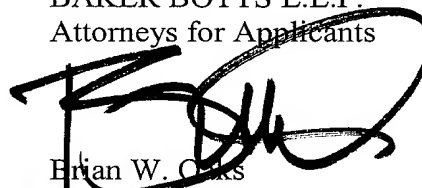
Applicants have made an earnest attempt to place this case in condition for allowance. For at least the foregoing reasons, Applicants respectfully request full allowance of all the pending claims.

If the Examiner feels that a telephone conference would advance prosecution of this Application in any manner, the Examiner is invited to contact Brian W. Oaks, Attorney for Applicant, at the Examiner's convenience at (214) 953-6986.

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Respectfully submitted,

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